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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/631,219
Filing Date: July 28, 2003
Appellant(s): SCHEPS, RICHARD

J. Eric Anderson
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 08/01/2007 appealing from the Office action mailed 11/13/2006.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

The Examiner further notes that claim 13 was rejected under 35 U.S.C 102(b) as being anticipated by US Patent 5530711 to Scheps. Claim 13 was unintentionally omitted from the 102(b) section heading, but was noted as being rejected under this heading on page 4 of the final office action dated 11/13/2006.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is substantially correct. The changes are as follows: Claim 13 is additionally believed to be on appeal and appears to have been unintentionally omitted under this heading.

(7) Claims Appendix

A substantially correct copy of appealed claims 1-11, and 13 appears on pages 11-13 of the Appendix to the appellant's brief. The minor errors are as follows: Claim 12 has been cancelled but is not listed as such in the Claims Appendix.

(8) Evidence Relied Upon

5530711	Scheps	06-1996

Merriam-Webster's Collegiate Dictionary, 10th Edition, pg.1073, "several"

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 3-7, and 9-11 are rejected under 35 U.S.C. 102(b) as being anticipated by Scheps (US 5530711).

With respect to claim 1, '711 discloses a laser (fig.9) comprising a first optically reflective element (fig.9 #39), a second optically reflective element (fig.9 #31e) opposed to and aligned with said first optically reflective element to define a laser cavity having an optical axis, a laser dye gain element (fig.9 #33) having a dye laser dye (col.14 lines 7-9) and which is interposed between said first and second optically reflective elements along said optical axis for transforming an optical pump signal into a resonant optical signal (col.4 lines 48-60), a laser diode system for generating and injecting said optical pump signal into said laser cavity (fig.9 #18,18') along said optical axis, where said optical pump signal is a sequence of optical pulses (col.19 lines 30-39) having a duration of about $n\tau_f$, where τ_f represents a fluorescence lifetime of said laser dye, and 3<=n<=25 (col.20 lines 15-20) so that said laser diode system operates in a non-steady-state mode (col.19 lines 30-49, diodes are operated in pulsed mode, which is non-steady-state).

A reference noted but not relied upon speaking towards the fact that pulsed operation is considered non-steady-state is Scheps (US 5307358), at col.1 lines 56-59.

With respect to claims 3 and 4, '711 discloses a laser as described in the rejection to claim 1, and also discloses the dye gain element to be of a host material from the group that includes porous glass, plastic, and sol-gels (col.3 lines 32-34) and further discloses the use of polymethylmethacrylate (col.3 line 34).

With respect to claim 5, '711 discloses a laser as described in the rejection to claim 1, and also disclose the first optically reflective element to have a curved reflective surface (fig.9 #39).

With respect to claim 6, '711 discloses a laser as described in the rejection to claim 1, and also discloses the first and second optically reflective elements to define a nearly hemispherical resonator (col.14 lines 25-31, describing a cavity with the reflective elements located such that a hemispherical laser resonator mode is formed, i.e. forming a hemispherical resonator).

With respect to claims 7, 9-11, and 13, '711 discloses the laser as described in the rejections to claims 1, and 3-5 above, while claims 7 and 9-11 are methods of generating the laser output signal and are hence rejected for the same reasons.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 2 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Scheps '711.

With respect to claim 2, '711 discloses the laser device as outlined in the rejection to claim 1 above, but does not explicitly define the pump signal to have a pulse period in the range of 1Khz to 1 Mhz. '711 does however teach that laser diodes can be modulated at a rate exceeding 1 Ghz (col.19 line 49) and that the lifetime of most dyes is several nanoseconds (col.19 lines 65-66). It is further stated that the lifetime of the laser gain element (being pumped) places an upper limit on the modulation rate that can be achieved (col.19 lines 57-59, meaning that lower modulation rates may be used, falling in the 1Khz to 1Mhz limit, and that the restriction is specifically on the upper limit of the pumped material). Therefor, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the laser device with the 1Khz to 1Mhz pump pulse period in order to properly tune the dye laser to deliver a fixed amount of energy per pulse avoiding damaging optical components (col.20 lines 19-29, and see MPEP 2144.05 (II a&b) speaking on optimization of ranges and effective variables).

With respect to claim 8, '711 discloses the laser as described in the rejections to claims 1, and 2 above, while claim 8 is a method of generating the laser output signal and is hence rejected for the same reasons.

(10) Response to Argument

I. The U.S.C. 102(b) rejection of claims 1, 3-7, 9-11, and 13.

Claims 1, 3-7, and 9-11

The Appellant has argued that Scheps does not disclose the optical pump signal generating laser diode system having a pulse width of about $n\tau_f$ where τ_f represents a fluorescence lifetime of said laser dye, and 3<=n<=25. This is the first instance in the prosecution history where the term “several” has been disputed.

Scheps, Column 20 lines 15-19, was cited to account for this limitation. This passage states that pulse lengths greater than several times the fluorescence lifetime are used to produce a steady state emission from the laser dye for most of the duration of the pulse (paraphrasing). The Appellant has stated that this is an "open-ended range of pulse widths" amounting to a disclosure of "several<= n <= infinity. The Examiner notes "several" is defined in Merriam-Webster's Collegiate Dictionary, 10th Edition, pg.1073 as: “an indefinite number more than two and fewer than many”. From this definition it would be clear to one of ordinary skill in the art that “several” would be defined most broadly as 2< several < many. Additionally one of ordinary skill in the art would have a general accepted meaning of the term "several” as a number typically in the range of 3-7. Therefor, as Scheps is found to disclose the pulse width to encompass, at the very least, the lowest end of the claimed 3<= n <= 25 range, the claimed limitation is met.

The Appellant has further argued that Scheps does not disclose a laser diode pumping source operating in non-steady-state mode, and has filed a declaration stating that pulsed mode does not equal non-steady-state mode.

Scheps, Column 19 lines 30-49, was cited to account for the non-steady-state operation limitation. This passage outlines operation of the pumping diodes in a pulsed mode. As per the filed declaration: "Only for the first 50-100 nanoseconds of a pulse, is a diode laser considered to be operating in non-steady-state mode. After the first 50-100 nanoseconds of a pulse, a diode laser operates in a quasi-continuous wave mode." The Examiner does not dispute this point.

The Examiner does not believe that the claim language clearly distinguishes the pumping diode operation from that of the prior art (Scheps). Scheps discloses pulsed operation of the pumping diodes. Pulsed operation of less than about 100 nanoseconds would be operation in **only** non-steady-state mode; however, operation greater than about 100 nanoseconds would comprise operation in non-steady state mode up to about 100 nanoseconds, and quasi-continuous wave mode operation thereafter. As the claim does not state operation **only** in non-steady-state mode it is believed that the pulsed mode of Scheps would clearly operate in a non-steady-state mode for a given interval prior to quasi-continuous operation, thereby meeting the claimed limitation.

The Appellant has further argued that claim 1 is limited to operation of the laser diode pumping source to non-steady-state mode.

The Examiner does not agree. The claim language states "…said laser diode system operates in a non-steady-state mode." This language does not limit the operation to only non-steady-state, but does require that non-steady-state operation be achieved during the diode operation. The arguments immediately preceding this section outline that during the disclosed pulsed operation of Scheps, the diodes clearly operate in a non-steady-state.

The Appellant has additionally argued that the diode laser system of claim 1 inherently operates in only non-steady-state as it is restricted to operation in the pulse width range of $n\tau_f$, 3<= n <=25.

Firstly the Examiner notes that the arguments preceding this section outline Scheps diode laser operation discloses at least the low end of the claimed 3<= n <= 25 range. As operation in this range is disclosed, the Appellant's argument is moot as the diode lasers of Scheps would thereby clearly operate in a non-steady-state mode as defined by the Appellant.

The Examiner additionally notes that the filed declaration describes non-steady-state operation occurs in the first 50-100 nanoseconds of a pulse. The pulse range stated in claim 1 is $n\tau_f$ where 3<= n <= 25. The fluorescence lifetime, or τ_f, is a property unique to a given laser dye material. Claim 1 does not limit the laser dye material to a particular type. Therefor, if a laser dye material with a large fluorescence lifetime were utilized, $n\tau_f$ could very well exceed 50-100 nanoseconds at the upper range of n,

meaning operation with a pulse length of $n\tau_f$ does not inherently refer to only non-steady-state operation.

Claim 13

The Appellant has argued that claim 13 is more limited than claims 7, and 9-11, which it was rejected with. The Appellant further argues that Scheps does not disclose the limitations found in claim 13 as has been argued with respect to claim 1.

The Examiner agrees that claim 13 is narrower than the above cited claims. On page 9 of the Appeal Brief the Appellant has described the more limited range to be $3\tau_f$-$25\tau_f$. The Examiner does not agree with this characterization. As was described on page 3 of the Final rejection dated 12/21/05, the claimed range is equal to $3 <= t/\tau_f <= 5$ where t is the pulse width ($t=n\tau_f$ of claim 1). Thus the claimed range is narrower, but not having the values outlined by the Appellant.

$$0.950 <= 1-e^{(-t/\tau_f)} <= 0.993$$

$$0.05 <= e^{(-t/\tau_f)} <= 0.007$$

$$-3 <= -t/\tau_f <= -5$$

(values rounded from -2.99 and -4.96 after natural log operation)

$$3 <= t/\tau_f <= 5$$

This is equivalent to claim 1 wherein $3 <= n <= 5$. As was shown above with respect to claim 1, Scheps discloses the pulse width of the pumping diodes to encompass at the very least the low end of the original $3 <= n <= 25$ range, which also reads on the $3 <= n <= 5$ limitation found in claim 13.

II. The U.S.C. 103(a) rejection of claims 2 and 8.

Claims 2 and 8

The Appellant has argued that a prima facie case of obviousness has not been established because not all the claim limitations are taught by Scheps; claims 2 and 8 being dependent from claim 1 thereby incorporate the missing limitations.

The Examiner does not agree. The Appellant has argued similar points to those addressed with regards to claim 1 and the Examiner rebuts similarly as above.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/Tod T Van Roy/

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